Vincent, Minn.; 26th, Saint Vincent, Minn.; South Canisteo, N. Y.; 27th, South Canisteo, N. Y.; 30th, Independence, Iowa; Saint Vincent, Minn.

THUNDER-STORMS.

Thunder-storms were reported during the month, by states and territories, as follows: 1st, 9; 2d, 11; 3d, 4; 4th, 2; 5th and 6th, 9; 7th, 5; 8th, 9; 9th, 7; 10th, 5; 11th, 1; 13th, 1; 14th, 3; 15th and 16th, 1; 18th, 2; 19th, 3; 20th, 1; 22d, 1; 24th, 1; 25th, 3; 26th, 2. None were reported on the 12th, 17th, 21st, 23d, and 27th to 30th.

Thunder-storms were reported in the several states and territories, by days, as follows: Ala. and Ariz., 2; Ark., 1; Cal., 4; Colo., 1; Dak., 3; Fla., 7; Ga., 1; Ill., 5; Ind., 3; Ind. Ter., 1; Iowa, 3; Kan., 4; Ky., 2; La., 3; Md. and Mass., 1; Mich., 6; Minn., 1; Miss., 3; Mo., 5; Nebr. and N. H., 1; N. J., 3; N. Y., 2; N. C., 1; Ohio, 6; Pa. and S. C., 2; Tenn., 4; Texas, 8; Wis., 2. In Conn., D. C., Idaho, Me., Mont., Nev., N. M., Oregon, R. I., Utah, Va., Wash., W. Va., and Wyo. no thunder-storms were reported.

Thunder-storms were reported in the greatest number of states and territories (11) on the 2d. On the 1st, 5th, 6th, and 8th they were noted in nine; on the 9th, in seven, and on the 7th and 10th in five.

They were reported on the greatest number of days (8) in Texas. In Iowa they were noted on seven; in Mich. and Ohio on six, and in Ill. and Mo. on five.

MISCELLANEOUS PHENOMENA.

FOREST AND PRAIRIE FIRES.

Jackson, Jackson Co., Minn., 2d: prairie fires are still raging in Sioux Valley township; five lives are reported to have been lost and a large amount of property has been destroyed.

Yankton, Dak., 13th: a large prairie fire is raging south of this place on the Nebraska side; the sky was lighted up by its flames during the early part of the evening.

Huron, Dak., 14th: a prairie fire swept along the north line of Sanborn and the south line of Beadle counties on the 12th; a large amount of hay and grain was burned.

Gary, Deuel Co., Dak., 14th: prairie fires raged in a forty-mile gale yesterday; this morning they are apparently out.

Aberdeen, Brown Co., Dak., 14th: large prairie fires are burning west and southwest of this place.

Prairie and forest fires also occurred on the following dates: Fort Sully, Dak., 1st to 3d; Fort Sill, Ind. T., 1st to 6th, 11th, 12th, 29th, and 30th; Bismarck, Dak., 6th, 13th, and 14th; Red Bluff, Cal., 8th, 9th, 11th to 14th.

HALOS.

Solar halos were most frequently reported in Michigan, where they occurred on thirteen days. In Tennessee they were noted on ten days; in Virginia on eight; in California and Illinois on seven; and in New York and South Carolina on six days. In Ariz., Conn., Ark., Dak., Fla., Ga., Idaho, Iowa, Kans., Ky., La., Me., Md., Mass., Minn., Miss., Mo., Mont., Nebr., Nev., N. H., N. J., N. C., Oreg., Pa., R. I., Tex., Utah, Wash., and Wis. on from one to five. They were reported in the greatest number of states and territories (13) on the 4th. On the 20th, 21st, and 29th no solar halos were reported.

Lunar halos were most frequently reported in Michigan, where they were noted on twelve dates; in Dak., Iowa, Kans., and Pa. on nine; in Va. on eight; in Ill., Minn., N. Y., N. C., Oreg., S. C., and Tenn. on seven. In Del., D. C., Md., N. M., and R. I. no lunar halos were noted. They were reported in the greatest number of states and territories (26) on the 13th. On the 4th, 6th, and 30th no lunar halos were noted.

METEORS.

The distribution of meteors, by dates, over the country was as follows: 1st, Vevay, Ind.; Barren Creek Springs, Md.; Egg Harbor City, N. J.; Wedgewood, N. Y.; Statesburgh, S. C.; Cleburne, Tex. 2d, Barren Creek Springs, Md.; Beverly, N. J. 3d, Parkston, Dak.; Dubuque, Iowa; Beverly and Egg Harbor City, N. J.; Randolph, W. Va. 4th, Parkston, Dak.; Manatee, Fla.; Wilmington, N. C. 5th, Fort Sully, Dak.; Archer, Fla.; Vevay, Ind.; Moorestown, N. J.; Fort Stanton, N. Mex. 6th, Parkston, Dak.; Barren Creek Springs, Md.; Amherst, Mass.; Beverly and Egg Harbor City, N. J.; Quakertown, Pa. 7th, Parkston, Dak.; Mantansas, Fla.; Utica, N. Y. 8th, Mantansas, Fla. 9th, Parkston, Dak. 10th, Independence, Iowa. 11th, Mantansas, Fla.; Independence, Iowa. 12th, Mantansas, Fla.; Independence, Iowa; Barne's Corners, N. Y.; Wauseon, Ohio. 13th, Vevay, Ind.; Kalamazoo, Mich.; Kansas City, Mo.; Wedgewood, N. Y.; College Hill, Ohio; Austin Tex. 19th and 20th, Independence, Iowa. 21st, Independence, Iowa; Beverly, N. J. 22d, Fort Buford, Dak.; Havannah, Ill.; Independence, Iowa; Beverly, N. J. 23d, Cleburne, Tex.; Green Bay, Wis. 25th, Little Rock, Ark. 26th, Fort Sully, Dak. 27th, Beverly, N. J. 29th, Parkston, Dak. 30th, McMinnville, Oreg.

The following are more notable meteoric displays reported:

Fallston, Md.: a brilliant meteor was observed above the eastern horizon at 6.43 p. m., 6th, passing towards the north.

Green Bay, Wis.: a brilliant meteor was observed at 6.30 p. m., 23d; it moved from near the zenith in a northeasterly direction, and burst into many fragments when about 15° above the horizon.

Little Rock, Ark.: a very brilliant meteor was observed in the southern sky at 10.12 p. m., 25th, about half way between the horizon and the zenith, and passing from east to west; the meteor remained visible about two seconds, and was accompanied by a trail which was apparently over 30° in length.

MIRAGE.

San Diego, Cal.: the Coronado Islands and Point Loma were distinctly seen on the 8th. At the latter place the small buildings adjoining the light-house were plainly visible.

Mirage were also observed as follows: Webster, Dak, 6th, 19th, 21st; Huron and Woonsocket, Dak., 12th; Parkston, Dak., 12th, 16th; Kimball, Dak., 12th, 25th, 26th; New England City, Dak., 30th; Hampton, Iowa, 26th.

SUN SPOTS.

Prof. F. P. Leavenworth, director, Haverford College Observatory, Pa. (observed by Mr. H. V. Gummere, assistant):

Date. November, 1888.	Number of new		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		Faculæ.		Remarks.
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	
1, 9 a. m.	0	0	0	0	0	0	0	0	2	5	Definition good.
2, 12 m.	0	0	0	0	0	0	0	0	5	34	Definition very good.
3, 3 p. m.*	0	0	0	0	0	0	0	0	....	16	Definition good.†
5, 4 p. m.	1	9	0	0	0	0	1	9	2	2	Definition poor.
6, 2 p. m.	0	10	0	0	0	0	1	19	8	25	Definition very good.
7, 11 a. m.	0	3	0	0	0	0	1	22	1	1	Definition poor.
12, 11 a. m.	1	8	0	0	0	0	2	30	1	9	Definition very good.
13, 10 a. m.	0	4	0	0	0	0	2	27	2	5	Definition good.
16, 9 a. m.	0	0	0	0	0	0	2	17	1	8	Definition good; through cl'ds.
17, 9 a. m.	0	0	1	6	0	0	1	3	0	0	Definition poor.
20, 10 a. m.	0	0	0	0	0	0	1	1	4	9	Definition good.
21, 3 p. m.	0	2	0	0	0	0	1	3	1	9	Definition poor.
22, 9 a. m.	0	0	0	0	0	0	1	3	2	8	Definition poor.
30, 10 a. m.	1	25	1	3	1	25	1	25	....	....	Definition good.‡

*Observed by Prof. F. P. Leavenworth. †Clouds; count of faculæ unfinished.
‡Clouds previous to observation of faculæ.

Sun spots were observed during the month as follows:

Mr. John W. James, Riley, McHenry Co., Ill.: None seen

until the 11th, tlfen a group a little west of sun's meridian, and another one day from east edge. The largest spot, estimated at 31,400 miles in diameter, disappeared by solar rotation on the 16th, but failed to reappear on east edge. The other spot, estimated at 22,009 miles in diameter, disappeared by solar rotation on the 22d. Two other large spots on the east edge on the 27th.

Mr. H. D. Gowey, North Lewisburgh, Champaign Co., Ohio: sun spots were observed from the 11th to the 17th, and from the 20th to the 22d.

Mr. M. A. Veeder, Lyons, Wayne Co., N. Y.: 3d, much faculæ, followed by a large spot, came into view upon the sun; 17th, large spot and several smaller ones appeared; 26th, extensive disturbance, followed by spots, appeared.

VERIFICATIONS.

INDICATIONS FOR 24 HOURS IN ADVANCE.

The percentages of verifications of the 8 p. m. daily indications for November, 1888, as determined from comparison of succeeding telegraphic reports, are given in the table below.

The predictions for districts east of the Rocky Mountains for November, 1888, were made by 1st Lieutenant H. H. C. Dunwoody, 4th Artillery, U. S. Army, Acting Signal Officer and Assistant, and those for the Pacific Coast districts were made at San Francisco, Cal., by 2d Lieutenant J. E. Maxfield, Signal Corps; the verifications for all districts were determined by Assistant Professor C. F. Marvin.

Percentages of indications verified, November, 1888.

States.		States.	
Maine	84.4	Tennessee	84.9
New Hampshire	88.7	Kentucky	79.6
Vermont	80.3	Ohio	79.9
Massachusetts	82.2	West Virginia	80.9
Rhode Island	85.8	Indiana	77.3
Connecticut	83.1	Illinois	83.8
Eastern New York	78.8	Lower Michigan	83.2
Western New York	76.9	Upper Michigan	84.3
Eastern Pennsylvania	83.4	Wisconsin	88.1
Western Pennsylvania	81.3	Minnesota	85.3
New Jersey	81.5	Iowa	83.3
Delaware	84.9	Kansas	86.0
Maryland	84.7	Nebraska	89.9
District of Columbia	86.5	Missouri	83.9
Virginia	87.1	Colorado	85.5
North Carolina	88.8	Dakota	87.7
South Carolina	88.8	Southern California*	89.3
Georgia	84.5	Northern California*	88.9
Eastern Florida	86.1	Oregon*	78.9
Western Florida	80.6	Washington Territory*	78.0
Alabama	86.7	*By elements:* Weather	85.6
Mississippi	87.1	Temperature	82.2
Louisiana	90.1	Monthly percentage of weather and temperature combined†	84.2
Texas	86.7		
Arkansas	83.1		

*In determining the monthly percentage of weather and temperature combined, the Pacific coast states are not included. †The monthly percentage of weather and temperature combined is determined by multiplying the percentage of weather by 6, and the percentage of temperature by 4, and dividing their sum by 10.

CAUTIONARY SIGNALS FOR NOVEMBER, 1888.

Statement showing percentages of justifications of wind signals and cold-wave signals for the month of November, 1888:

Wind signals.—Total number of signals ordered, one hundred and forty-three; justified as to velocity, wholly, ninety-four, partly ten; justified as to direction, one hundred and twenty. Of the signals ordered, one hundred and fifteen were cautionary, of which seventy were wholly, and eight partly, justified; twenty-eight were storm, of which twenty-four were wholly, and two partly, justified. Seventy-five were ordered for easterly winds, of which fifty-seven were justified; sixty-eight were ordered for westerly winds, of which sixty-three were justified. Number of winds without signals, twenty-six. Number of signals ordered late, thirteen. Percentage of justifications, 68.2.

Cold-wave signals.—Total number of signals ordered, one hundred and eighty-five; number wholly justified, one hundred and twenty-one, of which six were ordered late. Number partly justified, two. Number of severe cold waves without signals, thirteen. Percentage of justifications, 63.2.

Percentages of local verifications of the weather and temperature signals, as reported by the directors of the various State Weather Services for November, 1888.

States.	Weather.	Temperature.	States.	Weather.	Temperature.
Illinois	89.0	91.0	Nebraska	89.8	92.6
Indiana	89.1	85.1	New York	87.0	84.0
Kansas	80.4	84.9	Ohio	82.0	81.0
Louisiana (northern)	88.0	96.0	Tennessee	89.8	91.6
Louisiana (southern)	92.0	84.0	Texas	78.7	87.2
Michigan	82.9	77.6			

STATE WEATHER SERVICES.

[*Temperature in degrees Fahrenheit; precipitation, including melted snow, in inches and hundredths.*]

The following extracts are republished from reports for November, 1888, of the directors of the various state weather services:

ALABAMA.

November has been unusually mild, both in the condition of the weather and the range of temperature. It was not until the month was half gone that the first heavy frost occurred. Twenty days were fair and pleasant—favorable for all farming operations.

The frosts that occurred toward the close, although heavy, killed only the delicate plants. The fall has been unusually late. The average temperature was 1°.7 above the normal. There were three periods in which precipitation occurred. The first was the 8th and 9th; the second, 14th and 15th; and the third was the 19th. The average rainfall was 0.61 below the normal.

Summary.

Temperature.—Monthly mean, 53.6; highest monthly mean, 59.4, at Mobile; lowest, 47, at New Market; maximum, 82.7, at Mobile, 3d; minimum, 20, at Valley Head, 28th; range for state, 62.7; greatest local monthly range, 57, at Valley Head; least local monthly range, 43, at Edwardsville.

Precipitation.—Average for the state, 3.69; greatest, 6.56, at Gadsden; least, 1.83, at Motes.

Wind.—Prevailing direction, north.—*P. H. Mell, Signal Corps, Auburn, director.*

ARKANSAS.

Summary.

Temperature.—Monthly mean, 49.9; highest monthly mean, 55.8, at Forrest City; lowest monthly mean, 45.5, at Ozone; maximum, 87, at Lead Hill, 1st; minimum, 21, at Dayton, 28th; range for state, 66; greatest local monthly range, 62, at Lead Hill; least local monthly range, 37, at Dallas, and Prescott.

Precipitation.—Average for the state, 5.03; greatest, 9.65, at Lonoke; least, 0.31, at Prescott. Snow fell at Fort Smith, Dallas, and Ozone on the 9th, and at Lead Hill 30th. The snow was light, and melted as it fell.—*Prof. John C. Branner, Little Rock, director; W. U. Simons, Corporal, Signal Corps, assistant.*

ILLINOIS.

This has been one of the finest and most favorable Novembers experienced in this state for many years. Take it all through the weather has been exceptionally fine, with light frosts, few rainy days, and very equable temperature. The rainfall has been sufficient, but as it came during a few days in the early part of the month, farming operations were in no wise interrupted.

The temperature was above the average while the extremes were less than usual; no very high or low temperatures being reached. The highest temperature was on the 1st and 2d, and the lowest on the 20th and 21st. There were numerous frosts, but none very severe. About an inch of snow fell on the 15th and 16th, but it did not remain on the ground.

Summary.

Temperature.—The mean temperature of the month, 41.5, was 1.2 above that of the previous ten years. The mean of the northern division was 39.2,